INTEGRATED CIRCUITS

DATA SHEET

TDA5630; TDA5631

9 V VHF, hyperband and UHF mixer/oscillator for TV and VCR 3-band tuners

Product specification
File under Integrated Circuits, IC02

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Philips
Semiconductors





9 V VHF, hyperband and UHF mixer/oscillator for TV and VCR 3-band tuners

TDA5630; TDA5631

FEATURES

- Balanced mixer with a common emitter input for band A (single input)
- 2-pin oscillator for bands A and B
- Balanced mixer with a common base input for bands B and C (balanced input)
- 3-pin oscillator for band C
- Local oscillator buffer output for external synthesizer
- SAW filter preamplifier with a low output impedance to drive the SAW filter directly
- Band gap voltage stabilizer for oscillator stability
- Electronic band switch.

APPLICATIONS

- 3-band all channel TV and VCR tuners
- Any standard.

GENERAL DESCRIPTION

The TDA5630 and TDA5631 are monolithic integrated circuits that perform the mixer/oscillator functions for bands A, B and C in TV and VCR tuners. These low-power mixer/oscillators require a power supply of 9 V and are available in a very small package.

The devices give the designer the capability to design an economical and physically small 3-band tuner.

They are suitable for European standards, as illustrated in Fig.12, with the following RF bands: 48.25 to 168.25 MHz, 175.25 to 447.25 MHz and 455.25 to 855.25 MHz. With an appropriate tuned circuit, they are also suitable for NTSC all channel tuners (USA and Japan).

The tuner development time can be drastically reduced by using these devices.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_P	supply voltage		–	9.0	–	V
I_P	supply current		–	35	–	mA
f_{RF}	frequency range	RF input; band A; note 1	45	–	180	MHz
		RF input; band B; note 1	160	–	470	MHz
		RF input; band C; note 1	430	–	860	MHz
G_v	voltage gain	band A	–	25	–	dB
		band B	–	36	–	dB
		band C	–	36	–	dB
NF	noise figure	band A	–	7.5	–	dB
		band B	–	8	–	dB
		band C	–	9	–	dB
V_o	output voltage to get 1% cross modulation in channel	band A	–	118	–	dBμV
		band B	–	118	–	dBμV
		band C	–	118	–	dBμV

Note

1. The limits are related to the tank circuits used in Fig.12 and the intermediate frequency. Frequency bands may be adjusted by the choice of external components.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TDA5630T	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
TDA5630M	SSOP20	plastic shrink small outline package; 20 leads; body width 4.4 mm	SOT266-1
TDA5631T	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
TDA5631M	SSOP20	plastic shrink small outline package; 20 leads; body width 4.4 mm	SOT266-1

BLOCK DIAGRAM

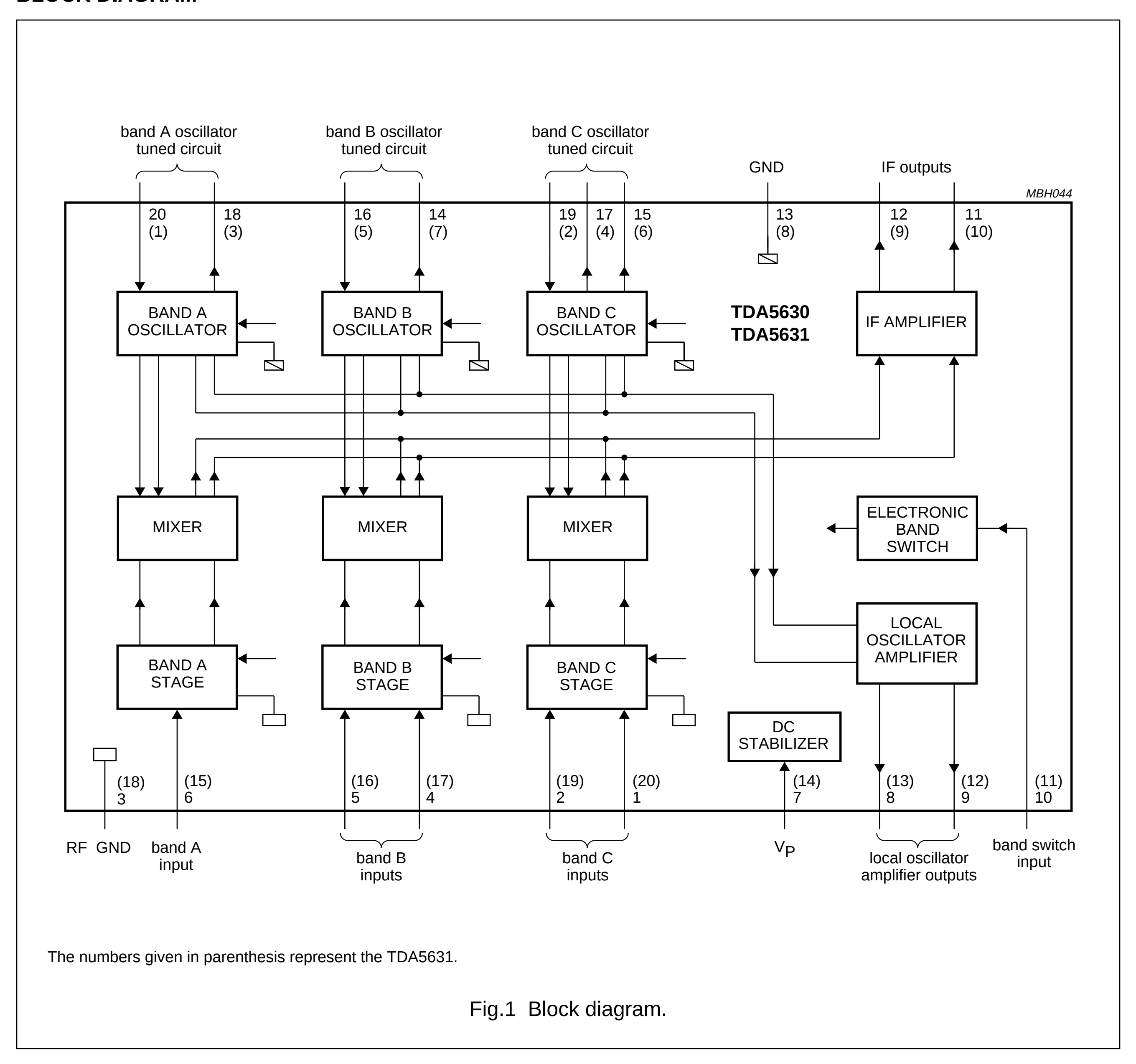


Fig.1 Block diagram.

9 V VHF, hyperband and UHF mixer/oscillator for TV and VCR 3-band tuners

TDA5630; TDA5631

PINNING

SYMBOL	PIN		DESCRIPTION
	TDA5630	TDA5631	
CIN1	1	20	band C input 1
CIN2	2	19	band C input 2
RFGND	3	18	ground for RF inputs
BIN1	4	17	band B input 1
BIN2	5	16	band B input 2
AIN	6	15	band A input
V_P	7	14	supply voltage
LOOUT1	8	13	local oscillator amplifier output 1
LOOUT2	9	12	local oscillator amplifier output 2
BS	10	11	band switch input
IFOUT1	11	10	IF amplifier output 1
IFOUT2	12	9	IF amplifier output 2
GND	13	8	ground (0 V)
BOSCOC	14	7	band B oscillator output collector
COSCOC1	15	6	band C oscillator output collector 1
BOSCIB	16	5	band B oscillator input base
COSCOC2	17	4	band C oscillator output collector 2
AOSCOC	18	3	band A oscillator output collector
COSCIB	19	2	band C oscillator input base
AOSCIB	20	1	band A oscillator input base

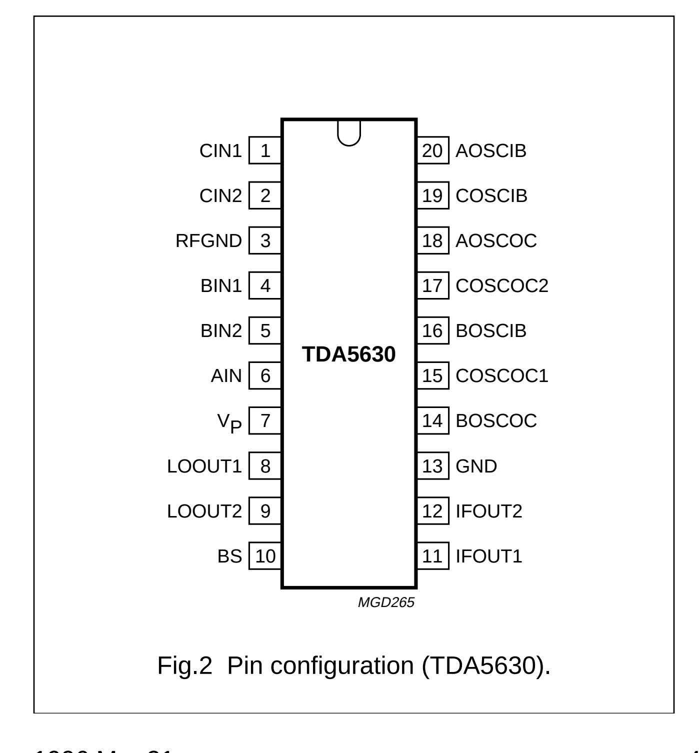


Fig.2 Pin configuration (TDA5630).

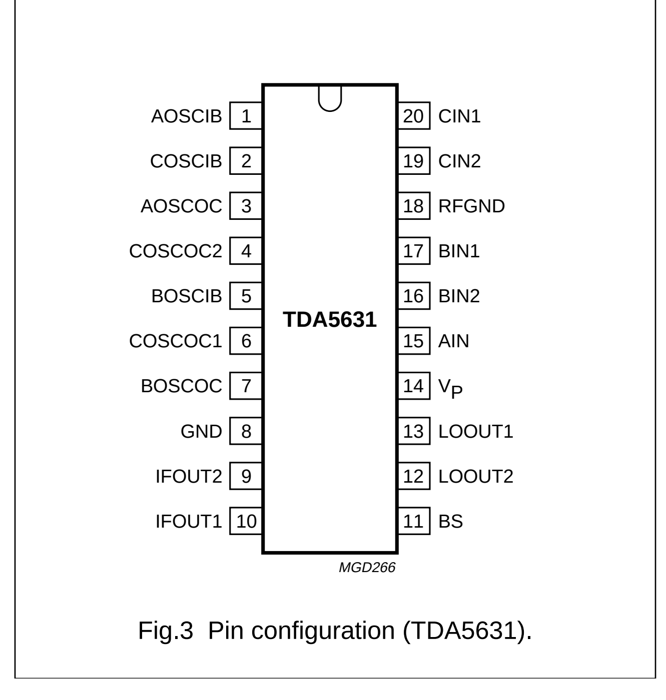


Fig.3 Pin configuration (TDA5631).

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_P	supply voltage	–0.3	+10.5	V
V_{SW}	switching voltage	0	10.5	V
I_O	output current of each pin referenced to ground	–	–10	mA
t_{sc}	maximum short-circuit time (all pins)	–	10	s
T_{stg}	IC storage temperature	–55	+150	°C
T_{amb}	operating ambient temperature	–10	+80	°C
T_j	junction temperature	–	+150	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient in free air		
	SOT163-1	100	K/W
	SOT266-1	120	K/W

HANDLING

Human body model: the IC withstands 2000 V in accordance with the MIL-STD-883C category B (stress reference pins 3, 7 and 13 shorted together for the TDA5630; pins 18, 14 and 8 for the TDA5631).

Machine model: the IC withstands 200 V in accordance with the MIL-STD-883C (stress reference pins 3, 7 and 13 shorted together for the TDA5630; pins 18, 14 and 8 for the TDA5631).

CHARACTERISTICS

V_P = 9 V; T_{amb} = 25 °C; measured in circuit of Fig.12; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply						
V_P	supply voltage		8.1	9.0	9.9	V
I_P	supply current		–	35	45	mA
V_{SW}	switching voltage	band A	0	–	1.1	V
		band B	1.6	–	2.4	V
		band C	3.0	–	5.0	V
I_{SW}	switching current	band A	–	–	2	μA
		band B	–	–	5	μA
		band C	–	–	10	μA
Band A mixer including IF amplifier						
f_{RF}	frequency range	note 1	45	–	180	MHz
G_v	voltage gain	f_{RF} = 50 MHz; see Fig.4; note 2	22.5	25	27.5	dB
		f_{RF} = 180 MHz; see Fig.4; note 2	22.5	25	27.5	dB
NF	noise figure	f_{RF} = 50 MHz; see Figs 5 and 6	–	7.5	9	dB
		f_{RF} = 180 MHz; see Figs 5 and 6	–	9	10	dB
V_o	output voltage causing 1% cross modulation in channel	f_{RF} = 180 MHz; see Fig.7	115	118	–	dBμV
V_i	input voltage causing 10 kHz pulling in channel	f_{RF} = 180 MHz; note 3	–	100	–	dBμV
g_{os}	optimum source conductance for noise figure	f_{RF} = 50 MHz	–	0.5	–	mS
		f_{RF} = 180 MHz	–	1.1	–	mS
g_i	input conductance	f_{RF} = 50 MHz; see Fig.13; note 4	–	0.26	–	mS
		f_{RF} = 180 MHz; see Fig.13; note 4	–	0.35	–	mS
C_i	input capacitance	f_{RF} = 50 to 180 MHz; see Fig.13; note 4	–	2	–	pF
Band A oscillator						
f_{osc}	frequency range	note 5	80	–	216	MHz
f_{shift}	frequency shift	ΔV_P = 10%; note 6	–	–	200	kHz
f_{drift}	frequency drift	ΔT = 25 °C with no compensation; NP0 capacitors; note 7	–	–	500	kHz
		5 s to 15 min after switch on; with no compensation; NP0 capacitors; note 8	–	–	200	kHz

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Band B mixer including IF amplifier; measurements using hybrid; note 9						
f_{RF}	frequency range	note 1	160	–	470	MHz
G_v	voltage gain	f_{RF} = 170 MHz; see Fig.8; note 2	33	36	39	dB
		f_{RF} = 470 MHz; see Fig.8; note 2	33	36	39	dB
NF	noise figure (not corrected for image)	f_{RF} = 170 MHz; see Fig.9	–	8	10	dB
		f_{RF} = 470 MHz; see Fig.9	–	8	10	dB
V_o	output voltage causing 1% cross modulation in channel	f_{RF} = 170 MHz; see Fig.10	115	118	–	dBμV
		f_{RF} = 470 MHz; see Fig.10	115	118	–	dBμV
V_i	input voltage causing 10 kHz pulling in channel	f_{RF} = 470 MHz; TDA5630T and TDA5631T; note 3	–	91	–	dBμV
		f_{RF} = 470 MHz; TDA5630M and TDA5631M; note 3	–	83	–	dBμV
	input voltage causing N + 5 – 1 MHz pulling	f_{RF} = 430 MHz; TDA5630T and TDA5631T; see Fig.11	–	81	–	dBμV
		f_{RF} = 430 MHz; TDA5630M and TDA5631M; see Fig.11	–	66	–	dBμV
Z_i	input impedance ($R_S + jL_S\omega$)	R_S; see Fig.14; note 4	–	30	–	Ω
		L_S; see Fig.14; note 4	–	8	–	nH
Band B oscillator						
f_{OSC}	frequency range	note 5	200	–	500	MHz
f_{shift}	frequency shift	ΔV_P = 10%; note 6	–	–	400	kHz
f_{drift}	frequency drift	ΔT = 25 °C with no compensation: NP0 capacitors; note 7	–	–	2	MHz
		5 s to 15 min after switch on; with no compensation: NP0 capacitors; note 8	–	–	300	kHz
Band C mixer including IF amplifier; measurements using hybrid; note 9						
f_{RF}	frequency range	note 1	430	–	860	MHz
G_v	voltage gain	f_{RF} = 430 MHz; see Fig.8; note 2	33	36	39	dB
		f_{RF} = 860 MHz; see Fig.8; note 2	33	36	39	dB
NF	noise figure (not corrected for image)	f_{RF} = 430 MHz; see Fig.9	–	9	11	dB
		f_{RF} = 860 MHz; see Fig.9	–	9	11	dB
V_o	output voltage causing 1% cross modulation in channel	f_{RF} = 430 MHz; see Fig.10	115	118	–	dBμV
		f_{RF} = 860 MHz; see Fig.10	115	118	–	dBμV
V_i	input voltage causing 10 kHz pulling in channel	f_{RF} = 860 MHz; TDA5630T and TDA5631T; note 3	–	87	–	dBμV
		f_{RF} = 860 MHz; TDA5630M and TDA5631M; note 3	–	93	–	dBμV
	input voltage causing N + 5 – 1 MHz pulling	f_{RF} = 820 MHz; see Fig.11	–	61	–	dBμV

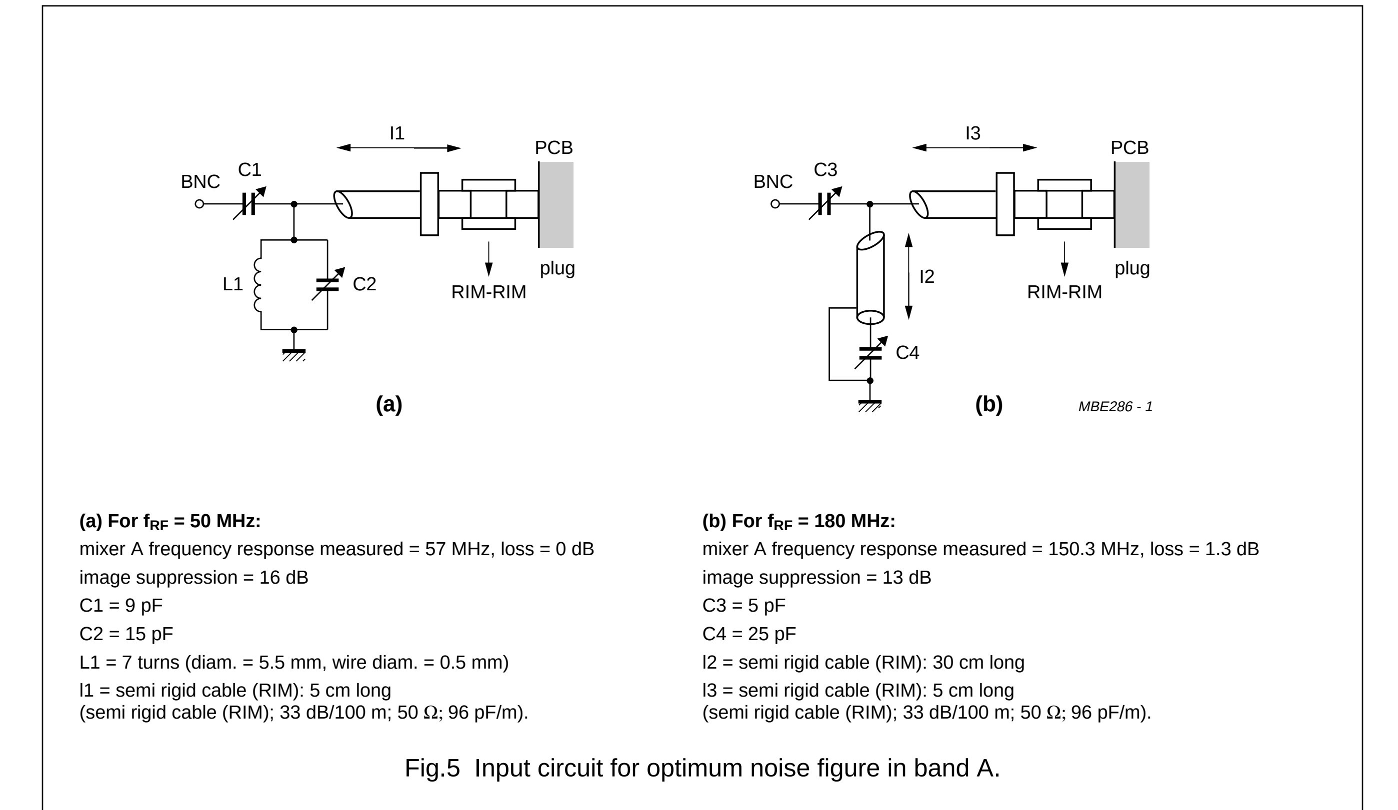
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Z_i	input impedance ($R_S + jL_S\omega$)	R_S at f_{RF} = 430 MHz; see Fig.15; note 4	–	40	–	Ω
		R_S at f_{RF} = 860 MHz; see Fig.15; note 4	–	53	–	Ω
		L_S at f_{RF} = 430 to 860 MHz; see Fig.15; note 4	–	9	–	nH
Band C oscillator						
f_{OSC}	frequency range	note 5	470	–	900	MHz
f_{shift}	frequency shift	ΔV_P = 10%; note 6	–	–	400	kHz
f_{drift}	frequency drift	ΔT = 25 °C with no compensation; NP0 capacitors; note 7	–	–	2.5	MHz
		5 s to 15 min after switch on; with no compensation; NP0 capacitors; note 8	–	–	600	kHz
IF amplifier						
S_{22}	output reflection coefficient	magnitude; see Fig.16; note 4	–	–10	–	dB
		phase; see Fig.16; note 4	–	9	–	°
Z_o	output impedance ($R_S + jL_S\omega$)	R_S; see Fig.16; note 4	–	95	–	Ω
		L_S; see Fig.16; note 4	–	45	–	nH
LO output; R_L = 100 Ω						
Y_o	output admittance ($G_P + jC_P\omega$)	f_{osc} = 80 MHz; see Fig.17; note 4	–	2.5	–	mS
			–	0.9	–	pF
		f_{osc} = 900 MHz; see Fig.17; note 4	–	3.5	–	mS
			–	0.7	–	pF
V_o	output voltage	R_L = 100 Ω	83	91	100	dBμV
SRF	spurious signal on LO output with respect to LO output signal	note 10	–	–	–10	dBc
SHD	LO signal harmonics with respect to LO signal		–	–	–10	dBc

Notes to the characteristics

1. The RF frequency range is defined by the oscillator frequency range and the intermediate frequency.
2. The gain is defined as the transducer gain (measured in Fig.12) plus the voltage transformation ratio of L6 to L7 (10 : 2, 15.4 dB including transformer loss).
3. The input level causing 10 kHz frequency detuning at the LO output. $f_{osc} = f_{RF} + 33.4$ MHz.
4. All S-parameters are referred to a 50 Ω system.
5. Limits are related to the tank circuits used in Fig.12. Frequency bands may be adjusted by the choice of external components.
6. The frequency shift is defined for a variation of power supply, first from V_P = 9 to 8.1 V, then from V_P = 9 to 9.9 V. In both cases, the frequency shift is below the specified value.
7. The frequency drift is defined for a variation of ambient temperature, first from T_{amb} = 25 °C to T_{amb} = 0 °C, then from T_{amb} = 25 °C to T_{amb} = 50 °C. In both cases, the frequency drift is below the specified value with NP0 capacitors. Capacitor types C1 to C11, as specified in Fig.12 for non-PLL applications, must be changed to series with other temperature coefficients (e.g. N330, N750 etc.).
8. Switch on drift is the change of oscillator frequency between 5s and 15 min after switch on.
9. The values have been corrected for hybrid and cable losses. The symmetrical output impedance of the hybrid is 100 Ω.
10. Measured with RF input voltage:
    a) RF voltage = 120 dBμV at f_{RF} < 180 MHz.
    b) RF voltage = 107.5 dBμV at 180 MHz < f_{RF} < 225 MHz.
    c) RF voltage = 97 dBμV at 225 MHz < f_{RF} < 860 MHz.

Z_{in} (AIN) >> 50 Ω => $V_i = 2 \times V_{meas}$.
$V_i = V_{meas}$ + 6 dB.
$V_o = V'_{meas}$ + 15.4 dB (transformer ratio N1/N2 = 5 and transformer loss).
$G_v = 20 \log (V_o/V_i) = 20 \log (V'_{meas}/V_{meas})$ + 9.4 dB.

Fig.4 Gain measurement in band A.



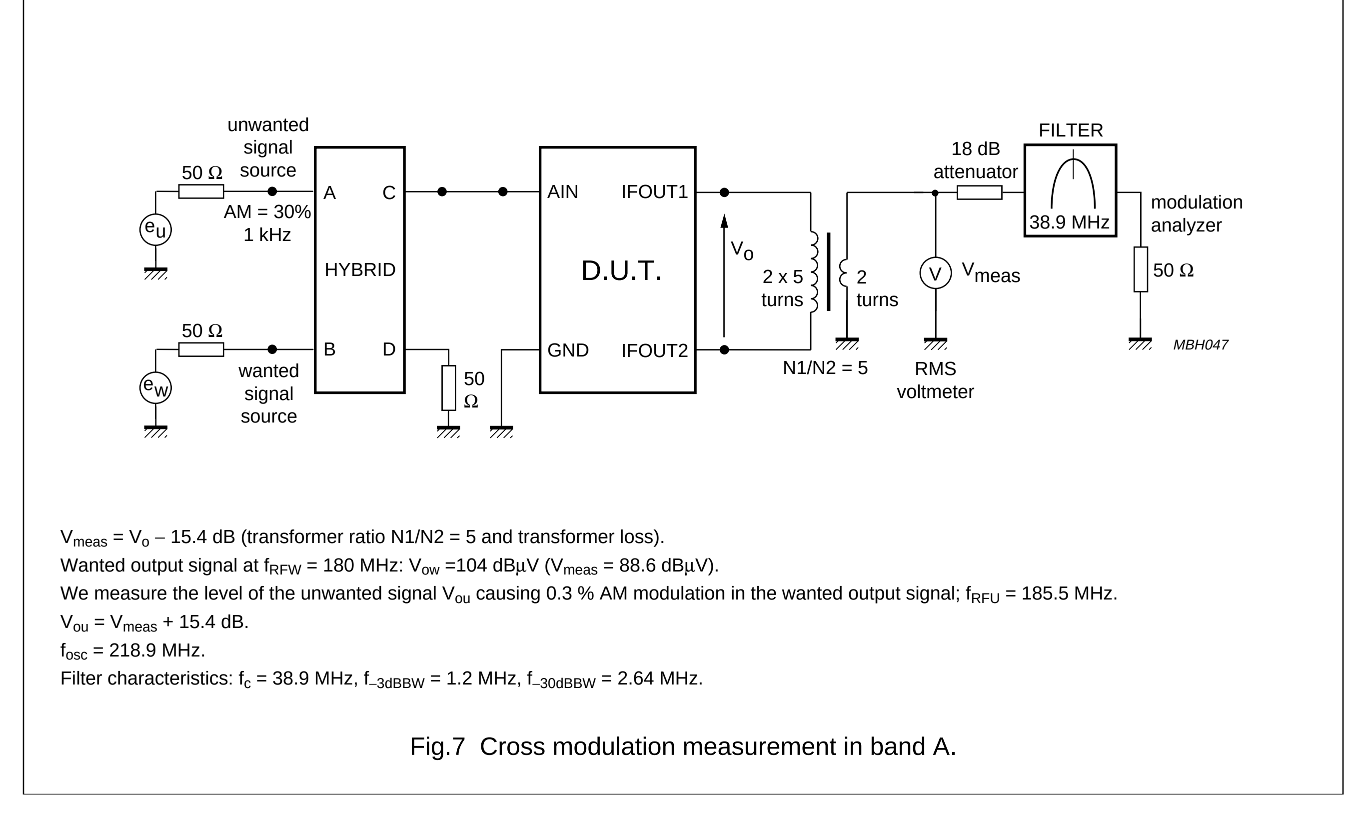
(a) For f_{RF} = 50 MHz:
mixer A frequency response measured = 57 MHz, loss = 0 dB
image suppression = 16 dB
C1 = 9 pF
C2 = 15 pF
L1 = 7 turns (diam. = 5.5 mm, wire diam. = 0.5 mm)
l1 = semi rigid cable (RIM): 5 cm long
(semi rigid cable (RIM); 33 dB/100 m; 50 Ω; 96 pF/m).

(b) For f_{RF} = 180 MHz:
mixer A frequency response measured = 150.3 MHz, loss = 1.3 dB
image suppression = 13 dB
C3 = 5 pF
C4 = 25 pF
l2 = semi rigid cable (RIM): 30 cm long
l3 = semi rigid cable (RIM): 5 cm long
(semi rigid cable (RIM); 33 dB/100 m; 50 Ω; 96 pF/m).

Fig.5 Input circuit for optimum noise figure in band A.

(1) NF = NF_{meas} – loss (input circuit) dB.

Fig.6 Noise figure measurement in band A.



$V_{meas} = V_o$ – 15.4 dB (transformer ratio N1/N2 = 5 and transformer loss).
Wanted output signal at f_{RFW} = 180 MHz: V_{ow} =104 dBμV (V_{meas} = 88.6 dBμV).
We measure the level of the unwanted signal V_{ou} causing 0.3 % AM modulation in the wanted output signal; f_{RFU} = 185.5 MHz.
$V_{ou} = V_{meas}$ + 15.4 dB.
f_{osc} = 218.9 MHz.
Filter characteristics: f_c = 38.9 MHz, f_{-3dBBW} = 1.2 MHz, $f_{-30dBBW}$ = 2.64 MHz.

Fig.7 Cross modulation measurement in band A.

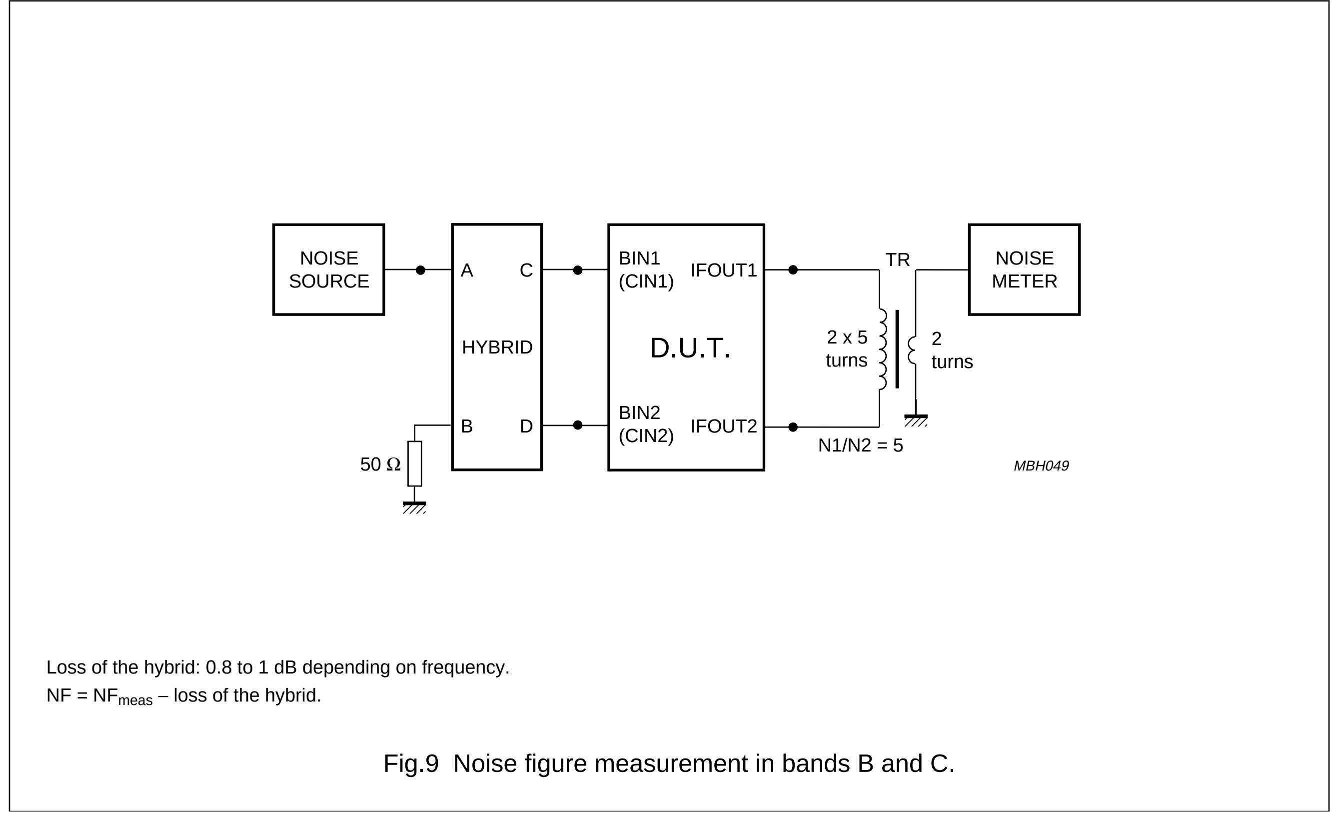
Loss of the hybrid: 0.8 to 1 dB depending on frequency.

$V_i = V_{meas}$ – loss of the hybrid.

$V_o = V'_{meas}$ + 15.4 dB (transformer ratio N1/N2 = 5 and transformer loss).

$G_v = 20 \log (V_o/V_i) = 20 \log (V'_{meas}/V_{meas})$ + 15.4 dB + loss of the hybrid.

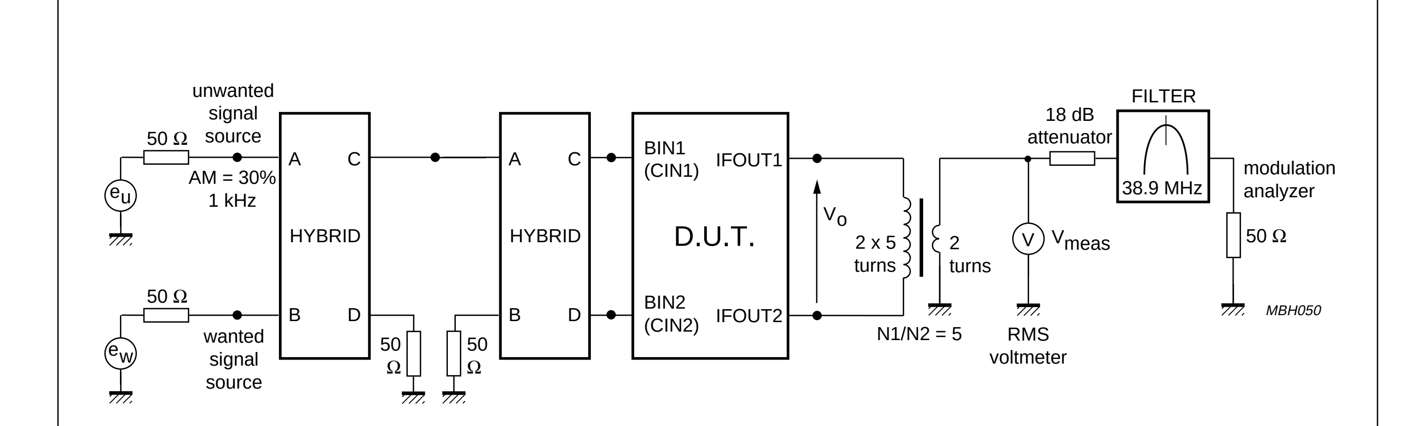
Fig.8 Gain measurement in bands B and C.



Loss of the hybrid: 0.8 to 1 dB depending on frequency.

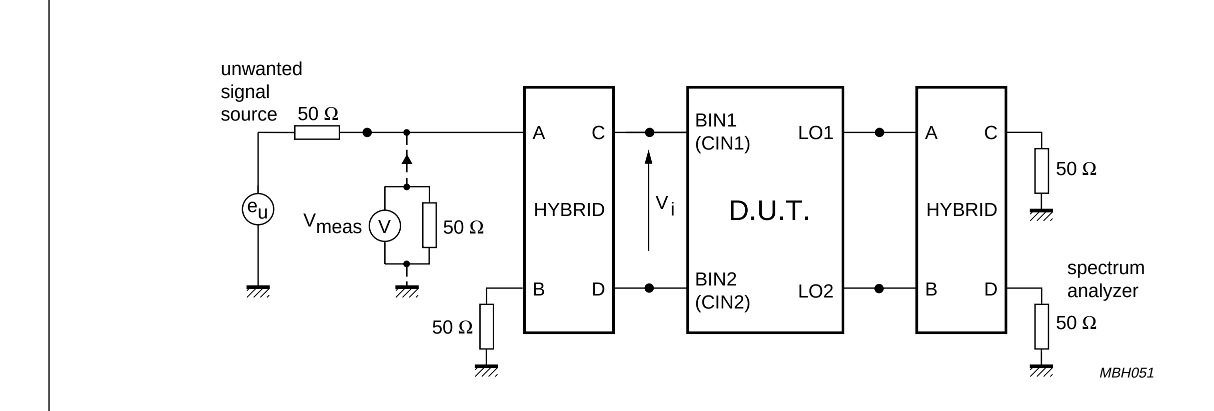
$NF = NF_{meas}$ – loss of the hybrid.

Fig.9 Noise figure measurement in bands B and C.



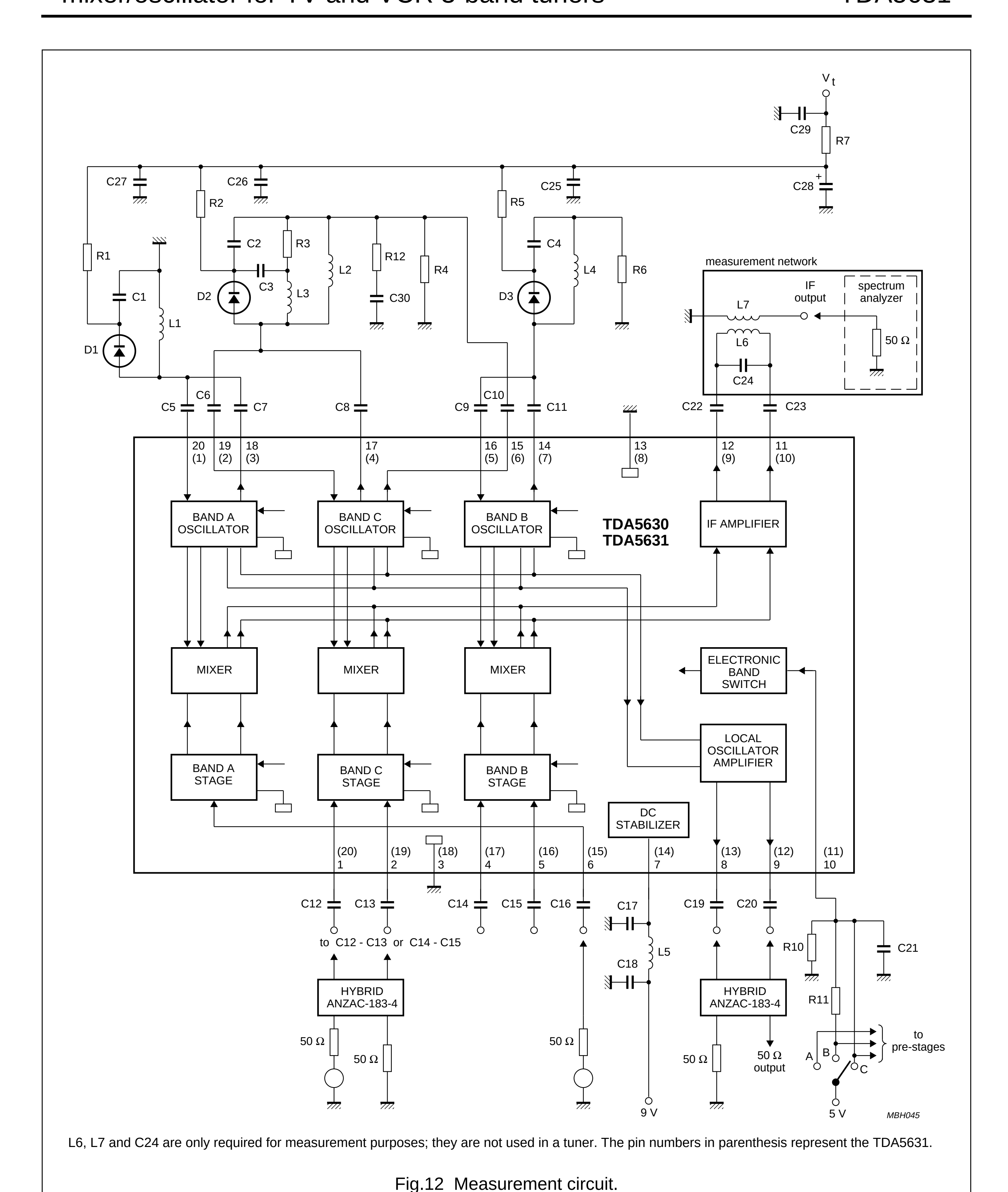
$V_{meas} = V_o$ – 15.4 dB (transformer ratio N1/N2 = 5 and transformer loss).
Wanted output signal at f_{RFW}: V_{ow} = 108 dBμV, V_{meas} = 92.6 dBμV.
We measure the level of the unwanted output signal V_{ou} causing 0.3 % AM modulation in the wanted output signal.
$V_{ou} = V_{meas}$ + 15.4 dB.
$f_{RFU} = f_{RFW}$ + 5.5 MHz; $f_{osc} = f_{RF}$ + 38.9 MHz.
Filter characteristics: f_c = 38.9 MHz; f_{-3dBBW} = 1.2 MHz; $f_{-30dBBW}$ = 2.64 MHz.

Fig.10 Cross modulation measurement in bands B and C.



Loss of the hybrid: 0.8 to 1 dB depending on frequency.
In band B: f_{RFW} = 391 MHz (in band C: f_{RFW} = 781 MHz). These wanted signals are not used during the measurement.
In band B: f_{osc} = 429.9 MHz (in band C: f_{osc} = 819.9 MHz).
In band B: f_{RFU} = 430 MHz = $f_{RFW} + 5 \times 8$ MHz – 1 MHz.(in band C: f_{RFU} = 820 MHz = $f_{RFW} + 5 \times 8$ MHz – 1 MHz).
We measure the level of the unwanted signal V_{iu} causing fm sidebands 30 dB below the oscillator carrier at the LO output.
$V_{iu} = V_{meas}$ – loss of the hybrid.

Fig.11 N + 5 – 1 MHz pulling measurement in bands B and C.



L6, L7 and C24 are only required for measurement purposes; they are not used in a tuner. The pin numbers in parenthesis represent the TDA5631.

Fig.12 Measurement circuit.

Component values for measurement circuit

Table 1 Capacitors (all SMD and NP0 except C28)

COMPONENT	VALUE
C1	82 pF
C2	5.6 pF
C3	100 pF
C4	150 pF
C5	2.2 pF
C6	1 pF
C7	2.2 pF
C8	1 pF
C9	1.8 pF
C10	2.2 pF
C11	3.9 pF
C12	1 nF
C13	1 nF
C14	1 nF
C15	1 nF
C16	1 nF
C17	1.5 nF
C18	1.5nF
C19	1 nF
C20	1 nF
C21	1.5 nF
C22	1 nF
C23	1 nF
C24	18 pF
C25	1.5 nF
C26	1.5 nF
C27	1.5 nF
C28	1 µF; 40 V electrolytic
C29	1.5 nF
C30	0.56 pF

Table 2 Resistors (all SMD)

COMPONENT	VALUE
R1	47 kΩ
R2	22 kΩ
R3	2.2 kΩ
R4	22 kΩ
R5	47 kΩ
R6	22 Ω
R7	1 kΩ
R10	15 kΩ
R11	22 kΩ
R12	470 Ω

Table 3 Diodes and IC

COMPONENT	VALUE
D1	BB911
D2	BB405 or BB215
D3	BB909 or BB219
IC	TDA5630T
	TDA5630M
	TDA5631T
	TDA5631M

Table 4 Coils (wire size 0.4 mm)

COMPONENT	VALUE
L1	7.5 turns; dia. 3 mm
L2	2.5 turns; dia. 3 mm
L3	1.5 turns; dia. 2.5 mm
L4	1.5 turns; dia. 4 mm
L5	4.7 µH; choke coil

Table 5 Transformers; note 1

COMPONENT	VALUE
L6	2 × 5 turns
L7	2 turns

Note

1. Coil type: TOKO 7 kN; material: 113 kN; screw core 03-0093; pot core 04-0026.

Fig.13 Input admittance (S11) of the band A mixer input (40 to 200 MHz); Y chart.

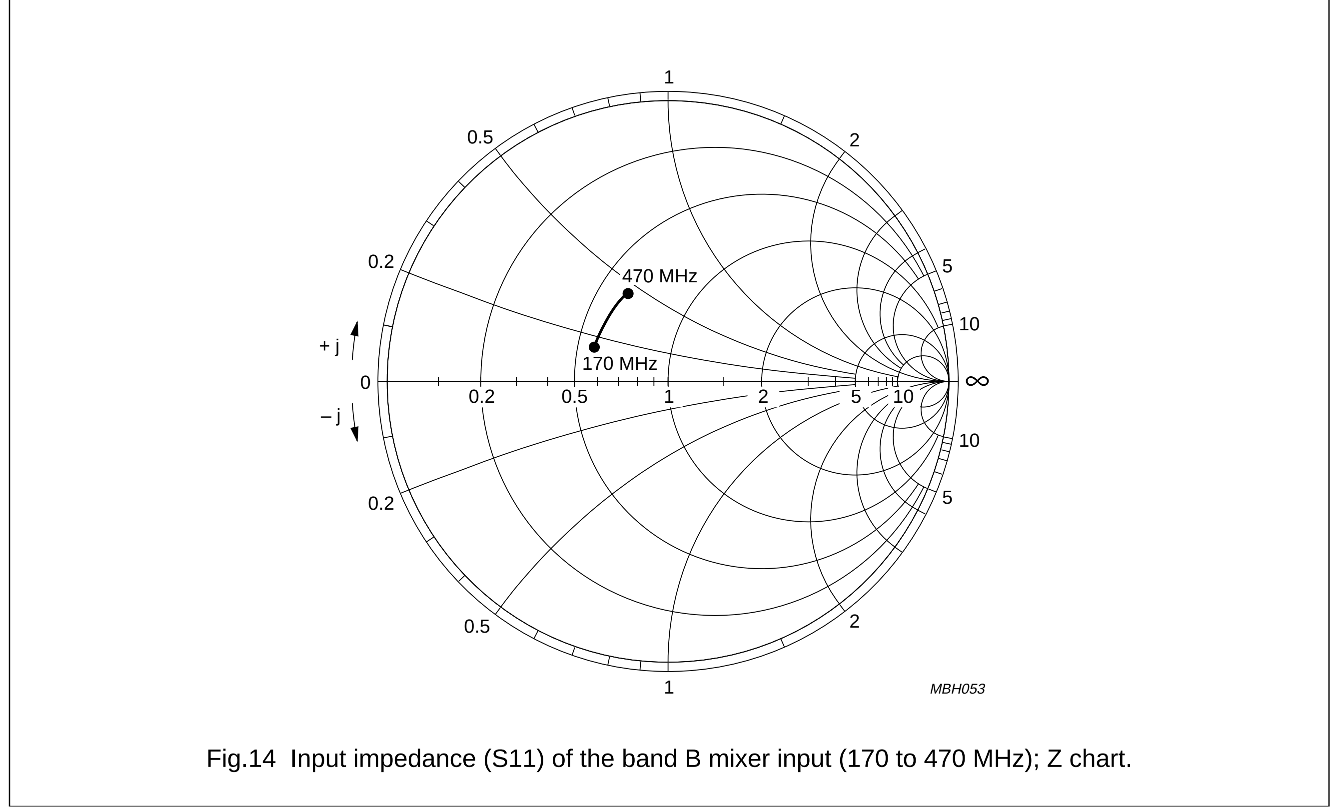


Fig.14 Input impedance (S11) of the band B mixer input (170 to 470 MHz); Z chart.

MBH054

Fig.15 Input impedance (S11) of the band C mixer input (430 to 860 MHz); Z chart.

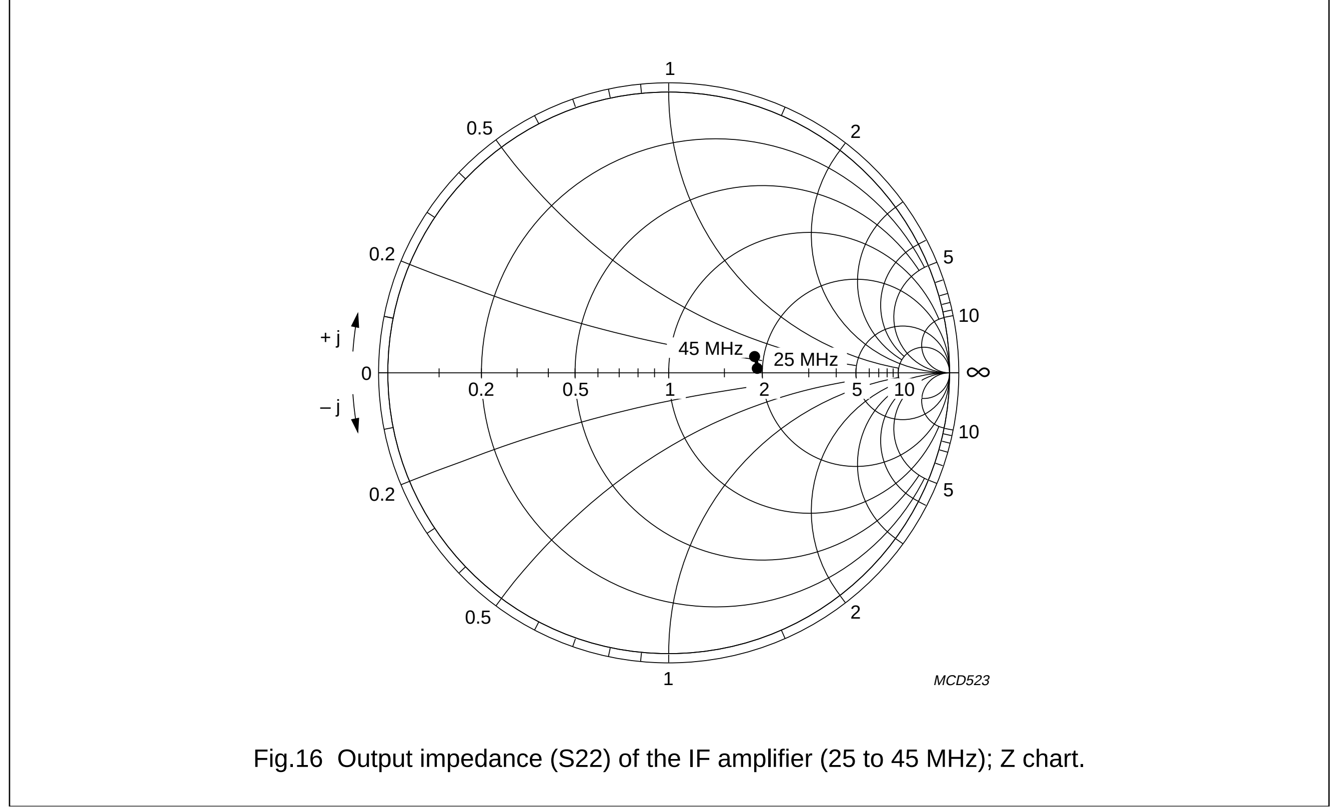


Fig.16 Output impedance (S22) of the IF amplifier (25 to 45 MHz); Z chart.

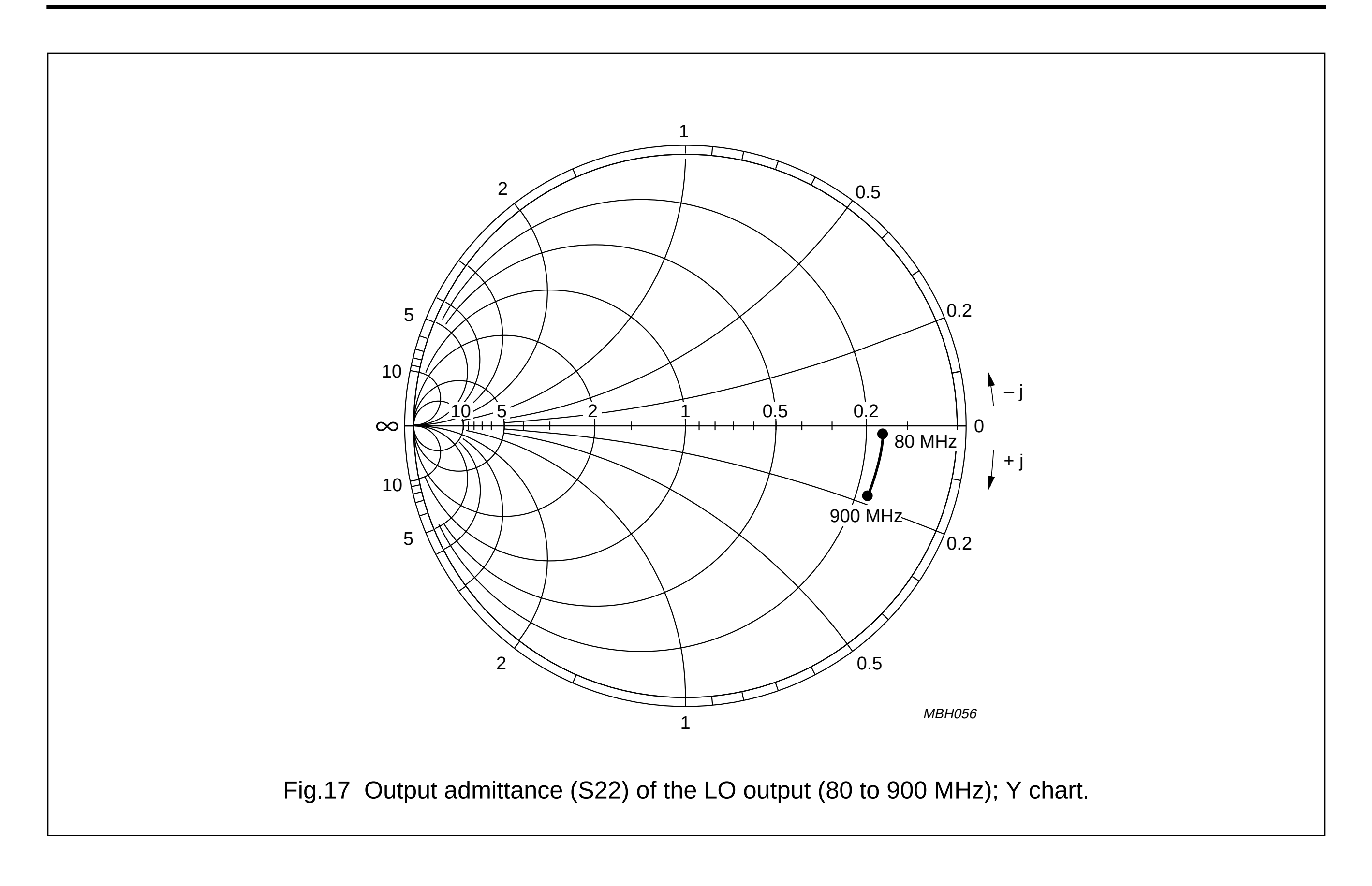


Fig.17 Output admittance (S22) of the LO output (80 to 900 MHz); Y chart.

INTERNAL PIN CONFIGURATION

SYMBOL	PIN		DESCRIPTION	AVERAGE DC VOLTAGE IN (V) MEASURED IN CIRCUIT OF Fig.12		
	TDA5630	TDA5631		BAND A	BAND B	BAND C
CIN1	1	20	1 (20), 2 (19), MBH059	NR(1)	NR(1)	2.2
CIN2	2	19		NR(1)	NR(1)	2.2
RFGND	3	18	3 (18), MBH062	0.0	0.0	0.0

SYMBOL	PIN		DESCRIPTION	AVERAGE DC VOLTAGE IN (V) MEASURED IN CIRCUIT OF Fig.12		
	TDA5630	TDA5631		BAND A	BAND B	BAND C
BIN1	4	17	4 (17); 5 (16); MBH058	NR(1)	2.2	NR(1)
BIN2	5	16		NR(1)	2.2	NR(1)
AIN	6	15	6 (15); MBH057	2.2	NR(1)	NR(1)
V_P	7	14	supply voltage	9.0	9.0	9.0
LOOUT1	8	13	8 (13); 9 (12); MBH063	7.3	7.3	7.3
LOOUT2	9	12		7.3	7.3	7.3
BS	10	11	10 (11); MBH060	0.0	2.0	5.0
IFOUT1	11	10	11 (10); 12 (9); MBH061	4.0	4.0	4.0
IFOUT2	12	9		4.0	4.0	4.0

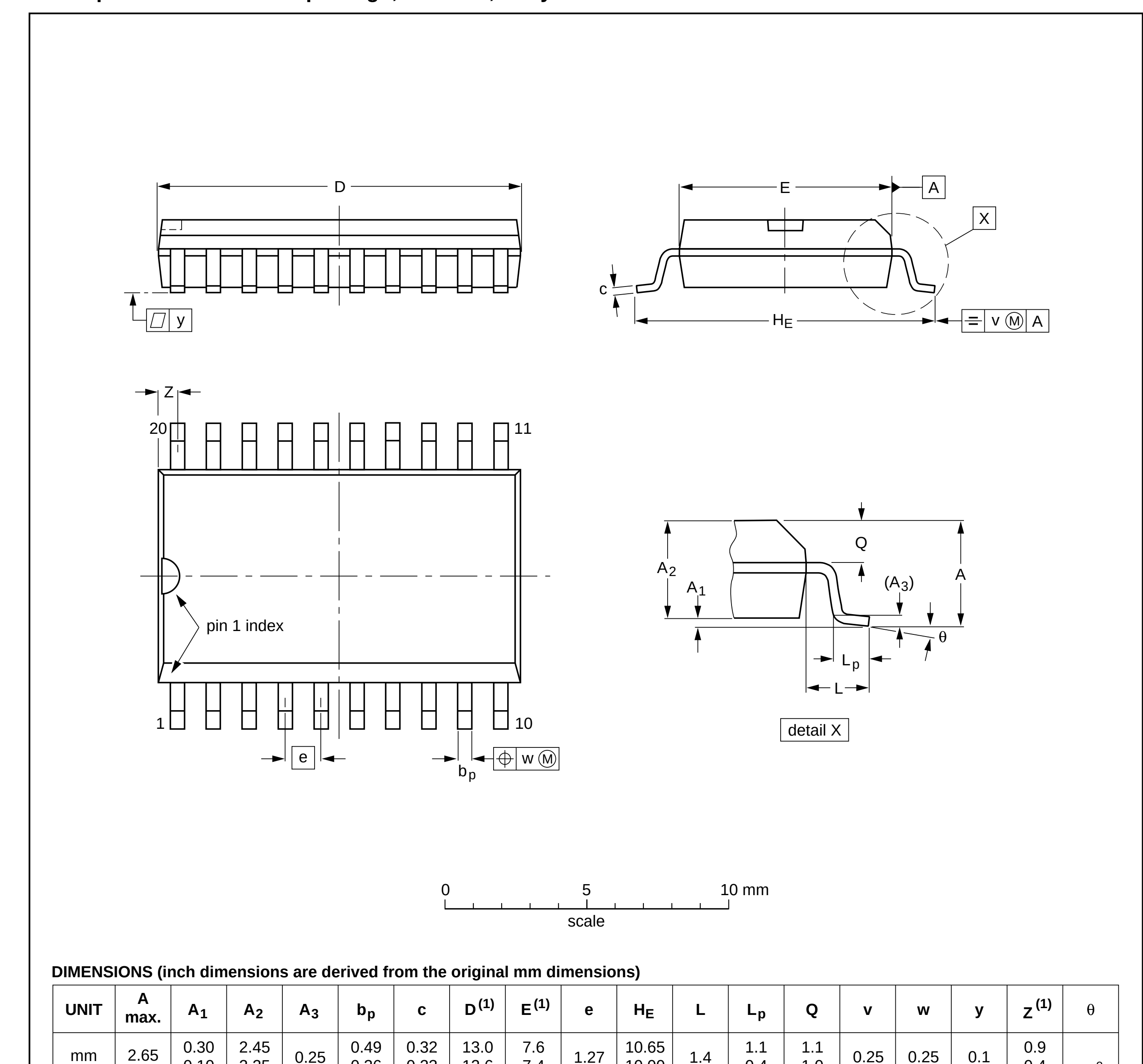
SYMBOL	PIN		DESCRIPTION	AVERAGE DC VOLTAGE IN (V) MEASURED IN CIRCUIT OF Fig.12		
	TDA5630	TDA5631		BAND A	BAND B	BAND C
GND	13	8		0	0	0
BOSCOC	14	7		NR[1]	3.6	NR[1]
BOSCIB	16	5		NR[1]	2.3	NR[1]
COSCOC 1	15	6		NR[1]	NR[1]	4.4
COSCOC 2	17	4		NR[1]	NR[1]	4.4
COSCIB	19	2		NR[1]	NR[1]	2.3
AOSCOC	18	3		4.0	NR[1]	NR[1]
AOSCIB	20	1		2.2	NR[1]	NR[1]

Note

1. NR = not relevant.

PACKAGE OUTLINES

SO20: plastic small outline package; 20 leads; body width 7.5 mm — SOT163-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

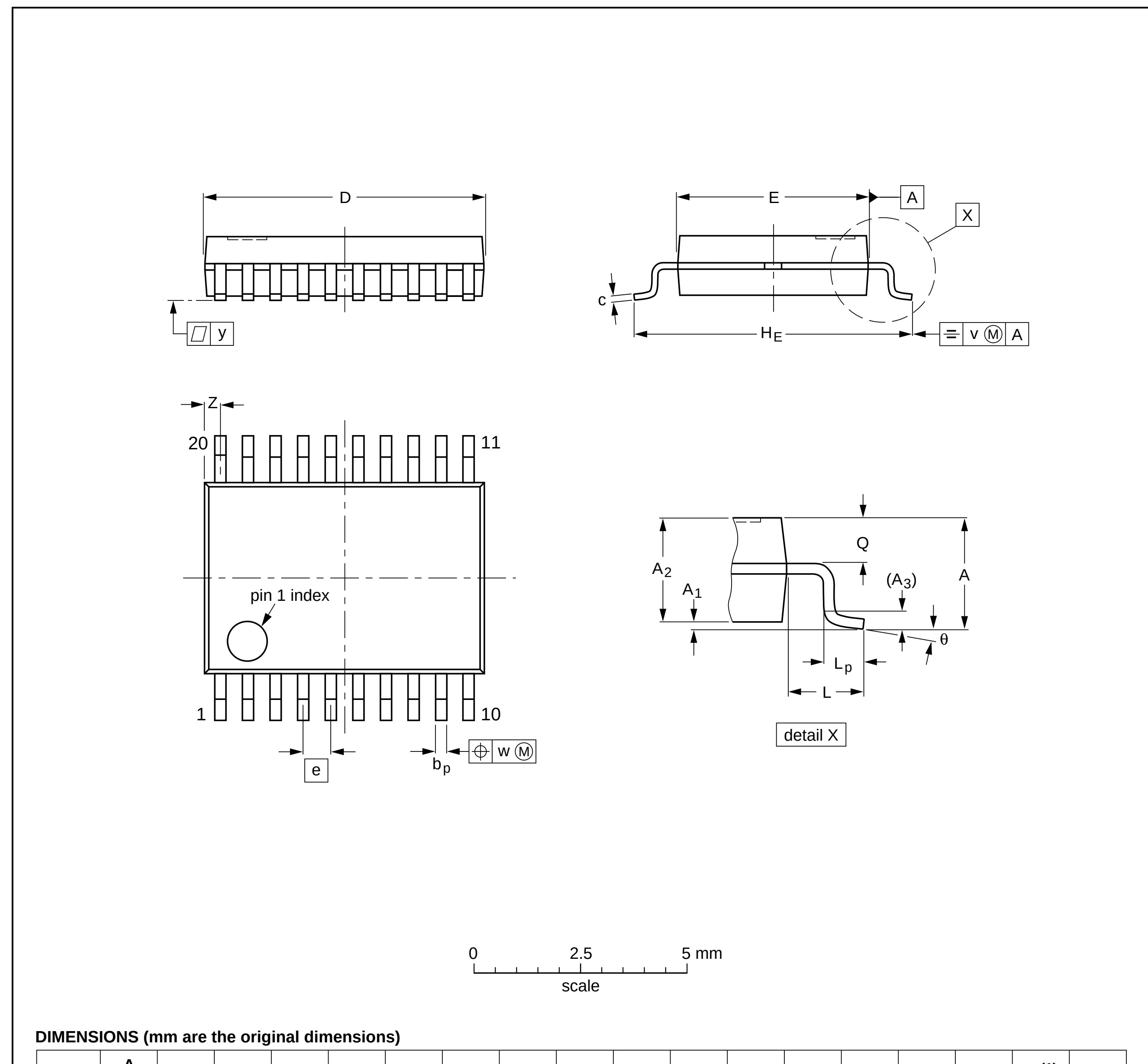
UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (1)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	0.050	0.42 0.39	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT163-1	075E04	MS-013AC				~~92-11-17~~ 95-01-24

SSOP20: plastic shrink small outline package; 20 leads; body width 4.4 mm **SOT266-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (1)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	1.5	0.15 0	1.4 1.2	0.25	0.32 0.20	0.20 0.13	6.6 6.4	4.5 4.3	0.65	6.6 6.2	1.0	0.75 0.45	0.65 0.45	0.2	0.13	0.1	0.48 0.18	10° 0°

Note

1. Plastic or metal protrusions of 0.20 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES					EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ				
SOT266-1							~~90-04-05~~ 95-02-25

SOLDERING

Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our *"IC Package Databook"* (order code 9398 652 90011).

Reflow soldering

Reflow soldering techniques are suitable for all SO and SSOP packages.

Reflow soldering requires solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the printed-circuit board by screen printing, stencilling or pressure-syringe dispensing before package placement.

Several techniques exist for reflowing; for example, thermal conduction by heated belt. Dwell times vary between 50 and 300 seconds depending on heating method. Typical reflow temperatures range from 215 to 250 °C.

Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 minutes at 45 °C.

Wave soldering

SO

Wave soldering techniques can be used for all SO packages if the following conditions are observed:

- A double-wave (a turbulent wave with high upward pressure followed by a smooth laminar wave) soldering technique should be used.
- The longitudinal axis of the package footprint must be parallel to the solder flow.
- The package footprint must incorporate solder thieves at the downstream end.

SSOP

Wave soldering is **not** recommended for SSOP packages. This is because of the likelihood of solder bridging due to closely-spaced leads and the possibility of incomplete solder penetration in multi-lead devices.

If wave soldering cannot be avoided, the following conditions must be observed:

- **A double-wave (a turbulent wave with high upward pressure followed by a smooth laminar wave) soldering technique should be used.**
- **The longitudinal axis of the package footprint must be parallel to the solder flow and must incorporate solder thieves at the downstream end.**

METHOD (SO AND SSOP)

During placement and before soldering, the package must be fixed with a droplet of adhesive. The adhesive can be applied by screen printing, pin transfer or syringe dispensing. The package can be soldered after the adhesive is cured.

Maximum permissible solder temperature is 260 °C, and maximum duration of package immersion in solder is 10 seconds, if cooled to less than 150 °C within 6 seconds. Typical dwell time is 4 seconds at 250 °C.

A mildly-activated flux will eliminate the need for removal of corrosive residues in most applications.

Repairing soldered joints

Fix the component by first soldering two diagonally-opposite end leads. Use only **a low voltage** soldering iron (**less than 24 V**) applied to the flat part of the lead. Contact time must be limited to 10 seconds at up to 300 °C. When using a dedicated tool, all other leads can be soldered in one operation within 2 to 5 seconds between 270 and 320 °C.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
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Where application information is given, it is advisory and does not form part of the specification.	

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